

Product User Guide

RFCurrent2000A



RFCurrent2000A

Wireless Current Data Logger

Table of Contents

RFCurrent2000A Data Logger

- Quick Start Steps 1
- Product Overview 2
- Additional Features & Operation 3
- Mounting Instructions 4
- Product Maintenance 5
- Recalibration 5
- RMA Instructions 5
- General Specifications..... 6-7

RFC1000 Transceiver

- Product Overview 9
- Installation Guide 9
- Mounting Instruction 10
- Channel Programming 11
- Deployment & Activation 12
- General Specifications..... 12
- Compliance Information 13

Troubleshooting Tips Back Cover

Quick Start Steps

Product Operation (Wireless)

1. Install the MadgeTech 4 Software and USB Drivers onto a Windows PC.
2. The RFC1000 interface device comes with a USB cable. Plug one end of the cable into an available USB port on the PC and plug the opposite end of the cable into the communication port on the RFC1000.
3. Push and hold the wireless button on the RFCurrent2000A for 5 seconds to activate wireless communication. The display will confirm "Wireless: ON" and the blue LED will blink every 15 seconds.
4. Launch the MadgeTech 4 Software. All active MadgeTech Data Loggers that are within range will automatically appear in the connected devices window. Each data logger in the list can be identified by serial number (printed on the exterior of the logger).
5. To claim a device, select the desired data logger in the list and click the **Claim** icon.
6. Select the start method, reading rate and any other parameters appropriate for the desired data logging application. Once configured, deploy the data logger by clicking the **Start** icon.
7. To download data, select the device in the list, click the **Stop** icon, and then click the **Download** icon. A graph will automatically display the data.

Product Operation (Plugged In)

1. Install the MadgeTech 4 Software and USB Drivers onto a Windows PC.
2. Before plugging the data logger in the computer, make sure the wireless setting on the device is set to "Wireless: OFF". If wireless mode is on, press and hold the Wireless button on the device for 5 seconds.
3. The RFCurrent2000A comes with a USB cable. Plug one end of the cable into an available USB port on the PC and plug the opposite end of the cable into the communication port on the RFCurrent2000A.
4. Launch the Data Logger Software. The RFCurrent2000A will appear in the connected devices window indicating the device has been recognized.
5. Select the start method, reading rate and any other parameters appropriate for the desired data logging application. Once configured, deploy the data logger by clicking the **Start** icon.
6. To download data, select the device in the list, click the **Stop** icon, and then click the **Download** icon. A graph will automatically display the data.

Product Overview

The RFCurrent2000A is a wireless data logger with display, designed to measure and record DC current signals. The data logger can connect directly to low-level DC current sources which makes it ideal for battery usage studies, energy monitoring studies and other DC current monitoring applications. The RFCurrent2000A can also be interfaced with a wide range of current output sensors such as flow meters, pH transmitters and more. Through the software, the device can be programmed with engineering units, which convert the current readings into a different unit of measure such as flow rate. The engineering unit is available for display on the LCD screen as well as in the software. The RFCurrent2000A is available in 20mA, 160mA or a 3A measurement range.

The RFCurrent2000A features an LCD screen which provides instant access to the current reading, minimum, maximum and average statistics. The statistics can be reset through the keypad of the device, allowing customers to keep track of statistics over certain time periods. This feature does not erase the data recorded, but only resets the statistics count. The RFCurrent2000A can be used as a standalone data logger, or used with the RFC1000 wireless transceiver, to transmit data back to a central PC. The RFCurrent2000A transmits up to 500 ft line of sight to the RFC1000 transceiver. Multiple RFC1000's can be used as repeaters and transmit up to 1000 ft line of sight to other RFC1000's. This allows the data to be sent over a greater distance.

Selection Buttons

The logger is designed with 3 direct selection buttons: Scroll, Units and Wireless.

- **Scroll:** Allows user to scroll through current readings, average stats and device status information displayed on the LCD Screen.
- **Units:** Allows user to change displayed units of measurement, A and mA Engineering Units.
- **Wireless:** Push and hold this button for 5 seconds to activate or deactivate wireless communication.
- **Manual Reset Option:** Allows user to manually reset the statistics within the device to 0 without needing to use the Data Logging software. Any data recorded up to that point is recorded and saved. To apply the manual reset, press and hold the scroll key down for three seconds.

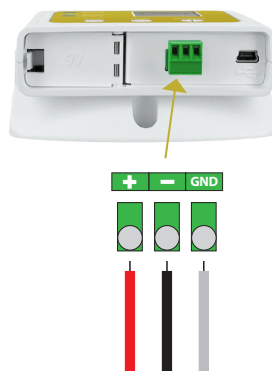
LED Indicators

- **Status:** Green LED blinks every 5 seconds to indicate unit is logging.
- **Wireless:** Blue LED blinks every 15 seconds to indicate unit is operating in wireless mode.
- **Alarm:** Red LED blinks every 1 second to indicate an alarm condition.

Connecting Information

Port Information

The RFCurrent2000A data logger terminal ports are located on the bottom of the device, one positive, one negative and a ground terminal port.



Additional Features and Operation

Alarm Settings/Rules

In the Data Logging Software, alarms can be created on two levels; in the software itself, and programmed specifically to the data logger. Creating alarm rules in the software allows the user to utilize alarms while real time recording, and have the added benefit of features such as e-mail and SMS notification. An alarm that is programmed on the data logger will only alert the user from the device itself, whether that is by a flashing LED, audible alarm, or local LCD notification.



Creating a Real time Alarm Rule

1. Within the Device tab in the Data Logging Software, in the Alarms group, click **Manage Rules**, then select **New**.
2. Enter a name in the Rule name box, and select whether notifications will occur when **All** conditions are met or **Any** condition is met.
3. Select the desired conditions to have met before notifications occur, and select which notifications will occur from the drop down menus.
4. If selecting to receive notifications by email or text message, click **Email settings** and make sure the correct info has been entered. Email and text message notifications will not be received if settings are incorrect.
5. Click **OK**. The **OK** button will be disabled if the Rule name box is empty.

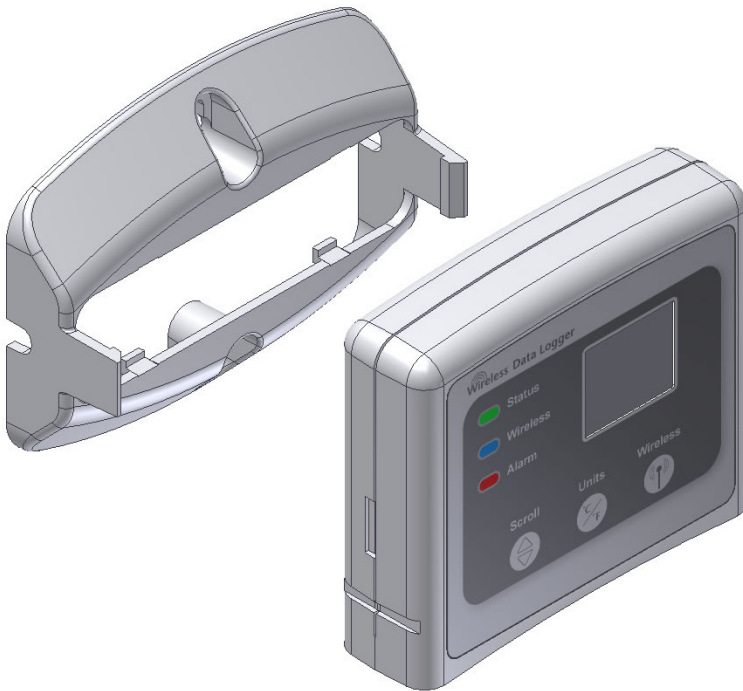
Changing the Alarm Settings of a Device

1. In the Connected devices panel, select the RFCurrent2000A device.
2. Click the **Properties** button under the device tab at the top of the software, and select the **Alarm** tab in the **Properties** window.
3. The High and Low settings indicate reading thresholds at which the alarm becomes active.
4. The Delay setting indicates how long to wait before the alarm becomes active after passing an alarm threshold.
5. The Use cumulative alarm delay checkbox indicates whether the alarm delay should reset when reading values fall back within the alarm threshold.
6. Once the alarm is configured appropriately, click **Apply** to save the settings.

Mounting Instructions

The base provided with the RFCurrent2000A can be used in two ways.

- The bottom of the logger snaps in place to use and mount the unit on a table top or horizontal surface.
- The base can also securely snap to the backside of the logger for wall mounting if desired (as shown below).
- There are two holes in the base to allow for screws for mounting.



Product Maintenance

Battery Replacement

Materials: U9VL-J Battery

1. On the bottom of the enclosure, open the battery compartment by pulling in on the cover tab.
2. Remove the battery by pulling it from the compartment.
3. Install the new battery, taking note of the polarity.
4. Push the cover closed until it clicks.

Recalibration

Standard recalibration for the RFCurrent2000A-3A are two points, 0 A and 1.00 A. For the RFCurrent2000A-20mA, the standard calibration points are 0 mA and 25 V. For the RFCurrent2000A-160mA the standard calibration points are 0 mA and 100 mA.

Recalibration is recommended annually for any data logger; a reminder is automatically displayed in the software when the device is due.

Pricing:

Recalibration traceable to NIST	\$70.00
Recalibration only	\$40.00

RMA Instructions

To send a device back in to MadgeTech, follow the instructions below to create an RMA (Return Merchandise Authorization) on the MadgeTech website:

1. Visit **www.madgetech.com**, under the **Services** tab select **RMA Process**.
2. When the web page opens, please sign in. If this is the first time, select **Click here to register an account** and create one. Once signed in, click on the **Make New RMA** button and fill in all the blank fields.
3. Complete the applicable fields on the form including customer Billing and Shipping information, even if they are the same. Please see the field explanation below for a more detailed description about questions asked in the Device Information section.
4. When all of the fields are complete, click **Generate RMA**.
5. Print out the confirmation page that follows containing the RMA number and MadgeTech's address for shipping. **A Return Merchandise Authorization must be accompanied by a copy of the RMA paperwork and shipping is prepaid by the customer.** The RMA number should be clearly marked on the outside of the package.
6. Please ship the package via UPS, FedEx, TNT, or DHL to the address listed on the confirmation page. USPS will not ship MadgeTech data loggers.
7. A notification email will be automatically sent when MadgeTech has received the RMA.

Countries approved for use, purchase and distribution of the RFCurrent2000A:

Australia, Austria, Belgium, Bulgaria, Canada, Chile, China, Columbia, Croatia, Cyprus, Czech Republic, Denmark, Ecuador, Estonia, Finland, France, Germany, Greece, Honduras, Hungary, Iceland, Ireland, Israel, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malaysia, Malta, Mexico, New Zealand, Norway, Poland, Portugal, Romania, Saudi Arabia, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, The Netherlands, Turkey, United Kingdom, United States, Venezuela, Vietnam

RFCurrent2000A General Specifications

Reading Rate	1 reading every second up to 1 reading every 24 hours
Memory	32,256 readings
Memory Wrap Around	Yes
Start Modes	Immediate Start & Delayed Start
Stop Modes	<ul style="list-style-type: none"> Manual through software Delayed Stop Timed (specific date and time)
Real Time Recording	The device may be used with PC to monitor and record data in real-time
Alarm	<p>User configurable audible, on-screen, email and text (SMS) alarms.</p> <p>Alarm Delay: A cumulative alarm delay may be set in which the device will activate the alarm (via LED) only when the device has recorded a user specified time duration of data.</p>
Audible Alarm Functionality	1 beep per second for reading alarm above/below threshold
LED Functionality	<ul style="list-style-type: none"> Green LED blinks every 10 seconds to indicate unit is logging Blue LED blinks every 30 seconds to indicate unit is in wireless mode Red LED blinks every 1 second to indicate alarm condition
Password Protection	An optional password may be programmed into the device to restrict access to configuration options. Data may be read out without the password.
Engineering Units	Native measurement units can be scaled to display measurement units of another type. This is useful when monitoring voltage outputs from different types of sensors such as temperature, CO2, flow rate and more.
Calibration	Digital Calibration through software.
Calibration Date	Automatically recorded through the device
Battery Type	Ultralife 9V Lithium included; user replaceable
Battery Life	Approximately 4 years typical for 15 minute reading rate
Data Format	μA, mA, A
Time Accuracy	± 1 minute/month
Computer Interface	USB to mini USB, 250,000 baud for standalone operation or RFC1000/RFC1000-CE/RFC1000-IP69K required for wireless operation
Software	XP SP3/Vista/Windows 7/Windows 8 (MadgeTech 4 only)
Operating Environment	-20 °C to +60 °C (-4 °F to +140 °F) 0 %RH to 95 %RH non-condensing
Dimensions	3.3 in x 3.5 in x 0.95 in (82.6 mm x 88.9 mm x 24.1 mm) - <i>Data logger only</i>
Weight	4.1 oz (0.2563 lbs)
Enclosure Material	ABS Plastic
Approvals	US (FCC), CA (IC), CE, South Korea (KCC), China (CMIIT), Japan (LCIE)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

To satisfy FCC RF Exposure requirements for mobile and base station transmission devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Measurement

Sensor Type	Current Sensing Circuitry		
Nominal Range	20 mA	160 mA	3 A
Measurement Range	-2 mA to +30 mA	-160 mA to +160 mA	-3 A to +3 A
Maximum Voltage Between Inputs to Ground	2.5 V	2.5 V	2.5 V
Measurement Resolution	0.0005mA for 20mA	0.01 mA for 160 mA	0.0001 A for 3 A
Calibrated Accuracy	±0.0025mA	±0.01mA	±0.0001 A
Input Impedance	10 Ω	1 Ω	0.02 Ω
Absolute Maximum Current	±232 mA for 2 Seconds	±707 mA for 2 Seconds	±5 A for 2 Seconds
Input Connection	Terminal Ports: one positive, one negative and a ground terminal port.		
Analog Conversion Time	150 mS		
Frequency Rejection	50+60 Hz		
Temperature Coefficient	< ±50 ppm/°C typical		
Response Time	0.15 Seconds at Sensor		

Wireless

RF Frequency	2.45 GHz IEEE 802.15.4 ultra-low power wireless transceiver with fully bi-directional communication
Band	ISM band 2.405-2.475 GHz Operation (channels 11 through 25) @ 250 kbps
Receiver Sensitivity (RFC1000)	-95 dBm typical
Transmission Distance (to other RFC1000's)	<ul style="list-style-type: none"> • RFC1000 4,000 ft max. outdoors - line of sight unobstructed 1,000 ft max. indoors - typical urban environment • RFC1000-CE 2,500 ft max. outdoors - line of sight unobstructed 700 ft max. indoors - typical urban environment • RFC1000-IP69K 4,000 ft max. outdoors - line of sight unobstructed 1,000 ft max. indoors - typical urban environment
Transmission Distance (to data loggers)	<ul style="list-style-type: none"> • RFC1000, RFC1000-CE & RFC1000-IP69K 2,000 ft max. outdoors - line of sight unobstructed 500 ft max. indoors - typical urban environment

Battery Warning

WARNING: BATTERY MAY LEAK, FLAME OR EXPLODE IF DISASSEMBLED, SHORTED, CHARGED, CONNECTED TOGETHER, MIXED WITH USED OR OTHER BATTERIES, AND/OR EXPOSED TO FIRE/HIGH TEMPERATURE. DISCARD USED BATTERY PROMPTLY, KEEP OUT OF REACH OF CHILDREN.

*Specifications subject to change.
See MadgeTech's terms and conditions at www.madgetech.com*

RFC1000

Wireless Transceiver



Other models available:

RFC1000-CE - Approved for
European markets

RFC1000-IP69K - Splash Proof
for harsh environments

Product Overview

The RFC1000 is a high powered transceiver that has a substantially long transmission range, providing enhanced performance in occluded environments (ovens, refrigerators, etc.). The RFC1000 also features an external antenna, allowing more flexibility with mounting positions in both orientation and proximity to metal walls. The device may be used as a repeater, or directly plugged into the Windows PC.

Transmission Distance

The RFC1000 transmits to other RFC1000s up to 4000 feet maximum typical outdoors/line of sight, 1000 feet maximum typical indoors/urban. The RFC1000 transmits to data loggers up to 2000 feet maximum typical outdoors/line of sight, 500 feet maximum typical indoors/urban. The RFC1000 can connect to a maximum of 64 data loggers. The RFC1000 transmits on a frequency of 2.405 GHz - 2.475 GHz.

Operating Environment

The RFC1000 is rated for use in an environment with temperatures from -20 °C to 85 °C and a humidity range of 0 %RH to 95 %RH non-condensing. The RFC1000 is rated IP40 and is protected against solids that are greater than 1mm in size. This device is not water resistant.

LEDs

The red LED indicates that the device has power. The green LED will blink when communicating with other devices.

Installation Guide



Installing the MadgeTech 4 Software

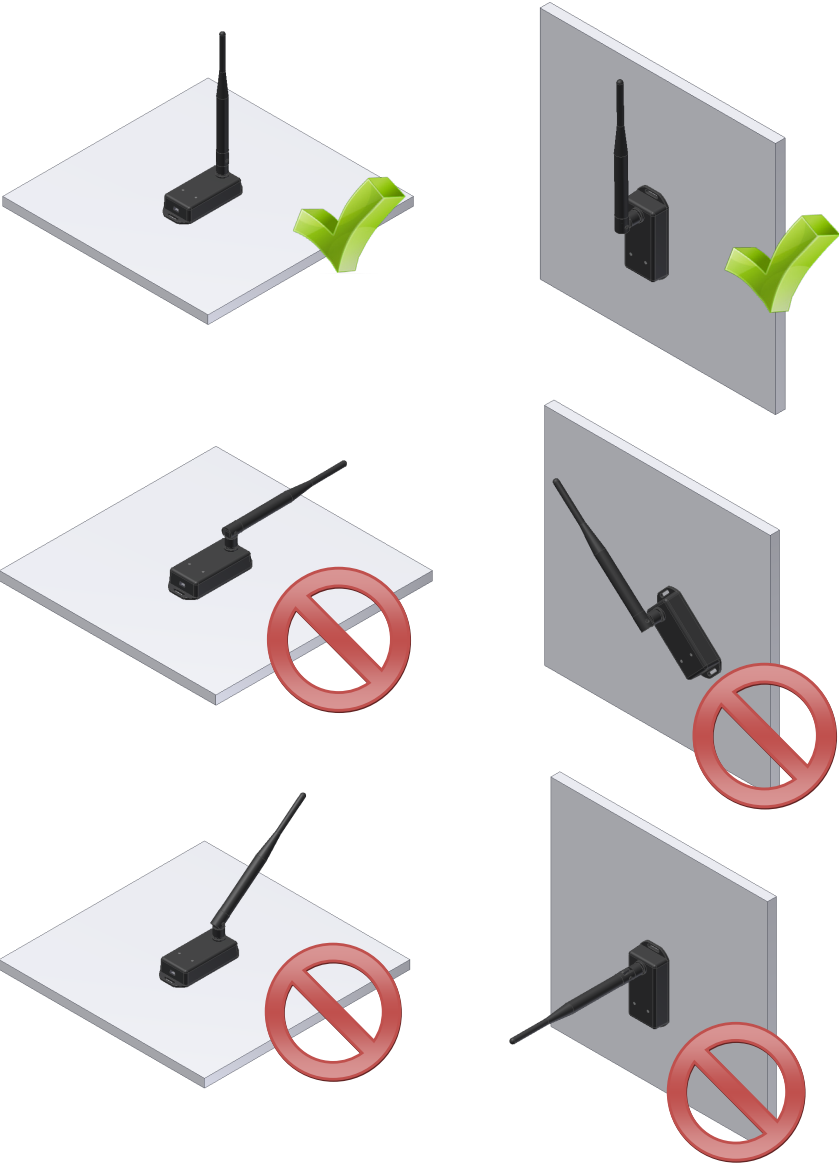
Insert the Data Logger Software Flash Drive into an open USB port on a Windows PC. If the autorun does not appear, locate the drive on the computer and double click on **Autorun.exe**. Follow the instructions provided in the Installation Wizard. Software can also be downloaded from the MadgeTech website at the following link: www.madgetech.com/software-download.

1. Locate the **Autorun.exe** file on the Software Flash Drive.
2. Select **"Data Logger Software"** in the Installer Options window panel.
3. If the Windows PC doesn't already have .NET 4.0 Framework, installation may be required.
*Note: To see if the .NET 4.0 Framework is installed, go to the Windows **Control Panel** and select **Programs**. "Microsoft .NET Framework 4.0" would be listed as a Windows program.*

Select **"Install Data Logger Software"** if .NET framework is installed on the Windows PC, or if installing on a Windows 8 machine.

Mounting Instructions

For best wireless performance, both the RFC1000 and the data loggers should be mounted in the same orientation. This usually means that the external antenna should be pointing straight up. The antenna can pivot to accommodate either a wall mount or a desk mount.

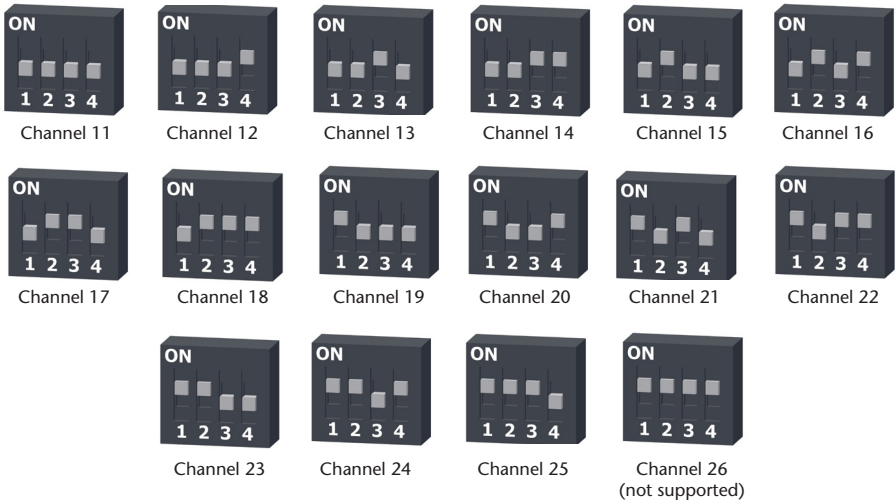


Channel Programming

The RFC1000 transmits data on the 2.4 GHz band and is programmed by default on channel 11. Each wireless Data Logger and RFC1000 has a set of dip switches with which the channel may be programmed.

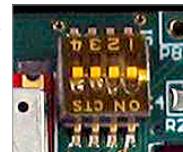
Different wireless channels may be used to create multiple networks in one area, or to avoid wireless interference from other devices. Any data logger or RFC1000 that is on the same network is required to use the same channel. If all of the devices are not on the same channel, the devices will not communicate with one another.

The images below show the orientations available of the switches for each channel. Channel 26 (all switches in the up position) is not supported.



Follow the instructions below to configure the channel settings of the RFC1000

1. To program the channel on an RFC1000, first unplug the RFC1000.
2. Use a Phillips head screwdriver to unscrew the enclosure.
3. Find the dip switches located on the front of the PCB circuit board.
4. Change the dip switches to match the desired channel using the diagram above.
5. Screw the enclosure back together and reconnect the RFC1000.



Close-up

- RFCurrent2000A:** To program the channel on the RFCurrent2000A data logger, start by switching the wireless mode to **OFF** by holding down the **Wireless** button on the data logger for 5 seconds.
- Step 1:** Use the USB Cable, plug the USB end of the cable into an available USB port on the PC.
- Step 2:** Plug the opposite end of the cable into the communication port on the RFCurrent2000A.
- Step 3:** Open the MadgeTech Software. Locate and select the RFCurrent2000A in the **Connected Devices** panel.
- Step 4:** In the **Device** tab, click the **Properties** icon. The **Properties** screen will display information about the device including **Wireless** setting.
- Step 5:** Under the **Wireless** tab, select a desired channel (11-25) that will match with the RFC1000. **Save** all changes, disconnect the data logger, and return the device to wireless mode by holding down the **Wireless** button for 5 seconds.

Deploying and Activating Devices

- Step 1:** Plug the RFC1000 into the USB port on the base station computer. *(Additional RFC1000s can be used as repeaters to transmit over greater distances)*
- Step 2:** If using multiple RFC1000s plug each one into a wall outlet in the desired locations. *(If transmitting over a distance greater than 1000 feet indoors or 4000 feet outdoors or there are walls/obstacles/corners that need to be maneuvered around, set up additional RFC1000s as needed.)*
- Step 3:** Verify that the data loggers are in wireless transmission mode. *(See Channel Programming steps above)*
- Step 4:** On a Windows PC, launch the MadgeTech 4 software program. All active data loggers will be listed in the software showing that the device(s) are recognized.
- Step 5:** To activate the data loggers, click on one to highlight, then click the **Claim** icon, and then click the **Start** button. Do this for each logger in the list that needs to be activated.

RFC1000 General Specifications

Interface Type	USB (to PC) / Wireless (to Data Logger)
Operating Environment	-20 °C to +85 °C, 0 %RH to 95 %RH non-condensing
LED Indicators	Red & Green
Enclosure Materials	ABS Plastic (body), PVC Plastic (antenna)
Dimensions	Enclosure: 3.8 in x 1.6 in x 0.8 in / Antenna: 7.2 in
Approvals	FCC ID: OA3MRF24J40MC, IC#: 7693A-24J40MC
Transmission Distance (To other RFC1000's)	<ul style="list-style-type: none">• RFC1000 & RFC1000-IP69K 4,000 ft max. outdoors - line of sight unobstructed 1,000 ft max. indoors - typical urban environment• RFC1000-CE 2,500 ft max. outdoors - line of sight unobstructed 700 ft max. indoors - typical urban environment
Transmission Distance (To data loggers)	<ul style="list-style-type: none">• RFC1000, RFC1000-CE & RFC1000-IP69K 2,000 ft max. outdoors - line of sight unobstructed 500 ft max. indoors - typical urban environment
Maximum number of connected data loggers	64
Frequency	2.405 GHz - 2.475 GHz
Ingress Protection	IP40

Compliance Information

- “This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.”
- “To satisfy FCC RF Exposure requirements for mobile and base station transmission devices, a separation distance of 20cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.”
- “This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.”

- “Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.”

Troubleshooting Tips

Why is the wireless data logger not appearing in the software?

If the **RFCurrent2000A** doesn't appear in the **Connected Devices** panel, or an error message is received while using the **RFCurrent2000A**, try the following:

- Check that the **RFC1000** is properly connected. For more information, see **Troubleshooting Interface Cable problems** (below).
- Ensure that the battery is not discharged. For best voltage accuracy, use a voltage meter connected to the battery of the device. If possible, try switching the battery with a new 9V lithium.
- Ensure that no other software is running in the background.
- Ensure that the most **current** data logger software is being used.
- Ensure that the **Connected Devices** panel is large enough to display devices. This can be verified by positioning the cursor on the edge of the **Connected Devices** panel until the resize cursor appears, then dragging the edge of the panel to resize it. The screen layout may also be reset in the options menu by selecting **File, Options**, and scrolling to the bottom.

Troubleshooting Interface Cable problems

Check that the software properly recognizes the connected RFC1000 wireless transceiver.

If the wireless data logger is not appearing in the **Connected Devices** list, it may be that the **RFC1000** is not properly connected.

1. In the software, click the **File** button, then click **Options**.
2. In the **Options** window, click **Communications**.
3. The **Detected Interfaces** box will list all of the available communication interfaces. If the **RFC1000** is listed here, then the software has correctly recognized and is ready to use it.

Check that Windows recognizes the connected RFC1000 wireless transceiver.

If the software does not recognize the **RFC1000**, there may be a problem with Windows or the USB drivers.

1. In Windows, click **Start**, right-click **Computer** and choose **Properties** or press **Windows+Break** as a keyboard shortcut.
2. Click **Device Manager** in the left hand column.
3. Double click **Universal Serial Bus Controllers**.
4. Look for an entry for **Data logger Interface**.
5. If the entry is present, and there are no warning messages or icons, then windows has correctly recognized the connected **RFC1000**.
6. If the entry is not present, or has an exclamation point icon next to it, the USB drivers may need to be installed. These are available on the software flash drive included with the **RFC1000**.

Ensure that the USB end of the RFC1000 is securely connected to the computer.

1. Locate the USB-A plug of the **RFC1000**.
2. If the interface cable is connected to the PC, unplug it. Wait ten seconds.
3. Reconnect the cable to the PC.
4. Check to make sure that the red LED is lit, indicating a successful connection.

MadgeTech, Inc.

6 Warner Road • Warner, NH 03278

Phone 603.456.2011 • Fax 603.456.2012

www.madgetech.com • info@madgetech.com

DOC 1265036-00 REV 2 2014.06.17